The second column gives the largest number of rods in the width of the rectangular piece: "This is the brede of yᵉ acre of londe in Roddis,"—in which the symbol yᵉ is, as is well known to scholars, the old Anglo-Saxon form of "the," the letter resembling a small y (*th*) having been retained (as in this manuscript) long after the form *Th* (for the capital) was adopted.

The third and fourth columns give the fractions of a rod in halves and fourths, "The halfe Rode" and "The quarter Rode" forming an interesting relic of the ancient use of those unit fractions which seem to have been first employed in Mesopotamia in the third millennium B.C. and which are familiar in Egyptian mathematics for a period of upwards of two thousand years.

Instead of then proceeding to eighths, which would have been a little too difficult for the farm owner, the maker of the table gives, in the next column, the number of feet, or, as he writes it, "The foote." The final column gives the inches and fractions,—"The ynche halfe and qr̄ter."

It will be observed that the numerals are Roman, the Hindu-Arabic forms not having as yet reached the great mass of commercial and industrial people in any country north of Italy, if, indeed, they may be said to have done so in Italy itself. The Roman numerals answered all ordinary needs so long as integers alone were involved, but they failed when elaborate fractions were demanded. This manuscript shows how the difficulty was met, both by the use of the unit fractions one half and one fourth with respect to the rod, as shown by the numerator 1 in the third and fourth columns, and with respect to the inch, as shown by the characters ($\sim$) for one half and ($\cdot$) for one fourth.

The need for such a table will become apparent if the reader will endeavor to find the width of a rectangle, say 12 rods long and containing precisely one acre, making use only of Roman numerals or the abacus in his computations. In this special case the table gives as the result 13 (xiij) rods, $\frac{1}{4}$ rod, 1 foot, $4\frac{1}{2}$ (iiij$\sim$) inches, which the reader may care to verify. The computations are accurate to a fraction of an inch, but the only fractions used in this connection are $\frac{1}{2}$ ($\sim$), $\frac{1}{4}$ ($\cdot$), and $\frac{3}{4}$ ($\sim$), and in some of his results the computer has erred by more than a quarter of an inch,—an error of no practical significance in the kind of computation for which the table was intended.

RECENT PUBLICATIONS.

REVIEWS.

The Absolute Relations of Time and Space. By A. A. ROBB. Cambridge, at the University Press, 1921. 8vo. 9 + 80 pages. Price 5 shillings.

Preface: "At the meeting of the British Association in 1902, Lord Rayleigh gave a paper entitled 'Does motion through the ether cause double refraction?' in which he described some experiments which seemed to indicate that the answer was in the negative. I recollect that on this occasion Professor Larmor was asked whether he would expect any such effect and he replied that he did not expect any.

"In the discussion which followed reference was made to the null results of all attempts to detect uniform motion through the aether and to the way in which things seemed to conspire together to give these null results.

"The impression made on me by this discussion was: that in order properly to understand what happened, it would be necessary to be quite clear as to what we mean by equality of lengths, etc., and I decided that I should try at some future time to carry out an analysis of this subject.

"I am not certain that I had not some idea of doing this even before the British Association meeting, but in any case, the inspiration came from Sir Joseph Larmor, either at this meeting or on some previous occasion while attending his lectures.

"Some years later I proceeded to try to carry out this idea, and while engaged in endeavouring to solve the problem, I heard for the first time of Einstein's work.

"From the first I felt that Einstein's standpoint and method of treatment were unsatisfactory, though his mathematical transformations might be sound enough, and I decided to proceed in my own way in search of a suitable basis for a theory.

"In particular I felt strongly repelled by the idea that events could be simultaneous to one person and not simultaneous to another; which was one of Einstein's chief contentions.

"This seemed to destroy all sense of the reality of the external world and to leave the physical universe no better than a dream, or rather, a nightmare.

"If two physicists A and B agree to discuss a physical experiment, their agreement implies that they admit, in some sense, a common world in which the experiment is supposed to take place.

"It might be urged perhaps that we have merely got a correspondence between the physical worlds of A and B, but if so, where, or how, does this correspondence subsist?

"It cannot be in A's mind alone, or it would not be a correspondence, and similarly it cannot be in B's mind alone.

"It seems to follow that it must be in some common sub-stratum; and this brings us at once back to an objective standpoint.

"The first work which I published on this subject was a short tract entitled *Optical Geometry of Motion, a New View of the Theory of Relativity* which appeared in 1911.

"This paper, though it did not claim to give a complete logical analysis of the subject, yet contained some of the germs of my later work and, in particular, it avoided any attempt to identify instants at different places. Later on the idea of *'Conical Order'* occurred to me, in which such instants are treated as definitely distinct.

"The working out of this idea was a somewhat lengthy task and in 1913 I published a short preliminary account of it under the title *A Theory of Time and Space*, which was also the title of a book on this subject on which I was then engaged.

"This book was in the press at the time of the outbreak of the war and was finally published toward the end of 1914.

"Unhappily at that period people were concerning themselves rather with trying to sever one another's connexions with Time and Space altogether, than with any attempt to understand such things; so that it was hardly an ideal occasion to bring out a book on the subject.

"The subject moreover was not an easy one, and I have been told more than once that my book is difficult reading.

"To this I can only reply as did Mr. Oliver Heaviside, under similar circumstances, that it was perhaps even more difficult to write.

"Be that as it may, the results arrived at fully justified my attitude towards Einstein's standpoint.

"I succeeded in developing a theory of Time and Space in terms of the relations of *before* and *after*, but in which these relations are regarded as absolute and not dependent on the particular observer.

"In fact it is not a 'theory of relativity' at all in Einstein's sense, although it certainly does involve relations.

"These relations of *before* and *after*, serving, as they do, as a physical basis for the mathematical theory, were quite ignored in Einstein's treatment; with the result that the absolute features were lost sight of.

"Even now, some six years from the date of publication of my book, comparatively few of Einstein's followers appear to realize the extreme importance of these relations, or to recognize how they alter the entire aspect of the subject.

"The theory, in so far as its postulates have an interpretation, becomes a physical theory in the ordinary sense, but these postulates are used to build up a pure mathematical structure.

"From the physical standpoint the question is: whether the postulates *as interpreted* are correct expressions of physical facts, or in some respect only approximations?

"If the postulates are not all correct expressions of the facts, then which of them require emendation and what emendation do they require?

"As regards the pure mathematical aspect of the theory: this of course remains unaffected by the physical interpretation of the postulates, and those who are interested only in pure mathematics may find that the method employed has certain advantages as a study of the foundations of geometry.

"In particular it may be noticed that by this method we get a system of geometry in which 'congruence' appears, not as something extraneous grafted on to an otherwise complete system, but as an intrinsic part of the system itself.

"I had intended making further developments of this theory, but the outbreak of the war caused an interruption of my work.

"In the meantime Einstein produced his 'generalized relativity' theory and the reader will doubtless wish to know how this work bears upon it.

"So far as I can at present judge, the situation is this: once coördinates have been introduced, the theory here developed gives rise to the same analysis as Einstein's so-called 'restricted relativity' and this latter cannot be regarded as satisfactory apart from my work, or some equivalent.

"Einstein's more recent work is extremely analytical in character.

"The *before* and *after* relations have not been employed at all in its foundation, although it is evident that, if these relations are a sufficient basis for the simple theory, they must play an equally important part in any generalization. Moreover these relations most certainly have a physical significance whatever theory be the correct one.

"A generalization of my own work is evidently possible and, to a certain extent, I can see a method of carrying this out, although I have not as yet worked out the details. (See Appendix.)

"In the meantime it seemed desirable to write some sort of introduction to my *Theory of Time and Space* which, while not going into the proofs of theorems, would yet convey to a larger circle of readers the main results arrived at in that work."

Contents—Preliminary considerations, 1–16; Conical order, 16–45; Normality of general lines having a common element, 46–55; Theory of congruences, 56–71; Introduction of coördinates, 72–75; Interpretation of results, 76–78; Appendix, 78–80.

Introduction to the Theory of Fourier's Series and Integrals. By H. S. CARSLAW. Second edition, completely revised. London, Macmillan, 1921. 8vo. 11 + 323 pp. Price 30 shillings.

Preface: "This book forms the first volume of the new edition of my book on *Fourier's Series and Integrals and the Mathematical Theory of the Conduction of Heat*, published in 1906, and now for some time out of print. Since 1906 so much advance has been made in the Theory of Fourier's Series and Integrals, as well as in the mathematical discussion of Heat Conduction, that it has seemed advisable to write a completely new work, and to issue the same in two volumes. The first volume, which now appears, is concerned with the Theory of Infinite Series and Integrals, with special reference to Fourier's Series and Integrals. The second volume will be devoted to the Mathematical Theory of the Conduction of Heat.

"No one can properly understand Fourier's Series and Integrals without a knowledge of what is involved in the convergence of infinite series and integrals. With these questions is bound up the development of the idea of a limit and a function, and both are founded upon the modern theory of real numbers. The first three chapters deal with these matters. In Chapter IV the Definite Integral is treated from Riemann's point of view, and special attention is given to the question of the convergence of infinite integrals. The theory of series whose terms are functions of a single variable, and the theory of integrals which contain an arbitrary parameter are discussed in Chapters V and VI. It will be seen that the two theories are closely related, and can be developed on similar lines.

"The treatment of Fourier's Series in Chapter VII depends on Dirichlet's Integrals. There and elsewhere throughout the book, the Second Theorem of Mean Value will be found an essential part of the argument. In the same chapter the work of Poisson is adapted to modern standard, and a prominent place is given to Fejér's work, both in the proof of the fundamental theorem and in the discussion of the nature of the convergence of Fourier's Series. Chapter IX is devoted to Gibbs's Phenomenon, and the last chapter to Fourier's Integrals. In this chapter the works